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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/855,321	05/14/2001	Tuomo Suntola	ASMMC.013C2	9994
20995 7590 02/21/2007 KNOBBE MARTENS OLSON & BEAR LLP 2040 MAIN STREET FOURTEENTH FLOOR IRVINE, CA 92614			EXAMINER TUROCY, DAVID P	
			ART UNIT 1762	PAPER NUMBER
SHORTENED STATUTORY PERIOD OF RESPONSE			NOTIFICATION DATE	
3 MONTHS			02/21/2007	
			DELIVERY MODE ELECTRONIC	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 02/21/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

jcartee@kmob.com  
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## Office Action Summary

Application No.

09/855,321

Applicant(s)

SUNTOLA ET AL.

Examiner

David Turocy

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12/6/2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 17-21 and 23-45 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 17-21 and 23-45 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>12/6/06</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/6/2006 has been entered.

### ***Response to Arguments***

Applicant argues that the amount of purge gas that inherently corresponds to the claimed amount is not taught. This is not found convincing. The present application is alleging that defining an amount of purge gas is a patentable feature. This is not true. The examiner has shown numerous instances where purging is known. The object of purging is to remove as much of the reactant that is not chemisorbed on to the substrate as possible. Thus, using the proper amount of gas to remove reactants from the reaction space, including the walls of the reactor (reactant on the walls are part of the reaction space), is inclusive of the purge step taught in the prior art. As discussed in previous office actions "at least two reactor space volumes" is an obscure and rather non-specific way of describing the amount of purge gas. The disclosure fails to appreciate that the measure of a volume of gas is dependant on the pressure. As discussed in the prior office actions, gases expand to fill any volume and therefore any

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volume of gas can be broadly considered to expand and fill the reaction space (X as defined by the claim). At a pressure of 20 Torr, which is very small compared to 760 Torr of standard conditions, a very little amount of gas is required to fill a very large amount of volume, as pressure and volume are inversely proportional according to gas laws. Therefore, even though the volume of the chamber is not explicitly taught, it is the position of the examiner that the flow rates and flow times explicitly taught read on moving multiple reaction space volumes of inactive gas through the reaction space for any sized reactor that would be used for coating silicon wafers. Therefore, contrary to the applicant's contention that for the inherency argument to hold, the prior art would necessarily have to teach of the reaction space volume, such a disclosure is in fact not necessary. Since, as discussed above, a small amount of gas expands to fill any volume and the claim fails to appreciate the pressure at which the volume of a gas, the first portion of the gas expands to fill the entire reaction space, i.e. X, and therefore the first portion of the purge can be deemed to move a volume the reaction space. Additionally, each subsequent portion of the purge will also expand to fill the reaction space, X, and therefore each portion will result in moving the volume of the reaction space. The applicants have provided no factual evidence to support their position with regard to inherency and therefore the arguments are deemed mere attorney speculation.

The applicants have supplied various articles to support their position that one skill in the art would be motivated to reduce the purge times, etc and therefore would not be motivated to optimize a purge time to reduce contamination on the surface of the

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walls. This is not found convincing. First, one of ordinary skill in the art balances the amount of purge gas, and the subsequent throughput, versus the degree of contamination. However, such a fact does not in itself rebut the fact that one of ordinary skill in the art would appreciate that the amount of purge gas does in fact determine the amount of contamination in the process chamber. Therefore one skilled in the art would be motivated to optimize the purge gas flow to reduce the contamination. The applicants argue the prior art fails to appreciate the reactants on the wall of the reaction space, however, the examiner notes that such a limitation is not present in the current claims and therefore such an argument is not commensurate in scope with the claims. Additionally, the examiner notes that the reactants on the wall surface are considered contaminants and therefore one, seeking to remove contaminants in the process chamber, would desire to provide purge gas to remove reactants on the chamber walls.

The applicants have noted purity of the reactants are a way to reduce contamination and therefore reduction of contamination would not motivate one to optimized purge flow, however, such an argument is not convincing. The purity of the gas source may be a factor in the contamination of the film, however, the purge time is also known as a factor and one would desire to optimize the purge gas to reduce the amount of contamination in the deposited film.

The conflict between the prior art and the present application in the case history has not been because this limitation is patentable, but because the claims use this obscure unit of measurement that is not easily converted to standard units of measurement without a given reactor volume. Many references use relative flow times,

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wherein the purge flow time exceeds the reactant flow time by 2-10 times. This is also inclusive of "at least two reactor space volumes". Even if the applicant wishes to argue that the prior art is not inclusive of this limitation, one of ordinary skill knows that the longer one purges, the more reactant may be removed. To optimize the purge time with cost of purge gas would have been at least obvious. Thus, defining a purge amount is not a patentable feature. As to the added limitations, ALE is explicitly taught in the abstract.

The applicant has argued against the Kitahara reference, stating the reference fails to supply the hydrogen concurrently with the reactant gases, however, the examiner notes Figure 3, where the flow of the hydrogen gas has a flow rate greater than 0 for the entire process and therefore reads on the limitations as claimed.

The examiner maintains the rejections of the previous Office Action for the reasons set forth above.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 17-21, 23-25 and 32-43 are rejected under 35 U.S.C. 102(b) as being anticipated by Kitahara et al. (US 5,300,186).

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Kitahara teaches an atomic layer epitaxy process in a vacuum with a steady pressure of 20 Torr (column 4, lines 45-50). Between reaction pulses, the reactant gases and "any residual component species remaining after the deposition" is purged from the reactor by introducing hydrogen for about three seconds (column 4, lines 60-68). This reads on removing the reactant from the walls of the reactor. The minimum flow rate of hydrogen taught is 2 SLM (standard liters per minute) and according to figure 3 much more than this is used during the purging steps. At a pressure of 20 Torr, which is very small compared to 760 Torrs of standard conditions, a very little amount of gas is required to fill a very large amount of volume, as pressure and volume are inversely proportional according to gas laws. Therefore, even though the volume of the chamber is not explicitly taught, it is the position of the examiner that the flow rates and flow times explicitly taught read on moving multiple reaction space volumes of inactive gas through the reaction space for any sized reactor that would be used for coating silicon wafers.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 17-21, 23-25 and 32-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahara et al. (US 5,300,186).

Kitahara teaches the limitations above. In the event the applicant disagrees with the Examiners assessment of the flow rate inherently filling multiple reaction space volumes, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to determine the volume of gas required to maximally remove the reactant gas and any residual component species remaining. By doing so, one would reduce contamination. Determining this amount would have been within the skill of one practicing in the art, through routine experimentation.

Claims 26-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahara et al. (US 5,300,186), as applied to claim 17 above, and further in view of Moore, Sr. (US 3,662,583).

Kitahara teaches the limitations to claim 17, but is silent to the use of oblong feed pipes. However, Moore teaches that using oblong feed types for feed a process space provides a wider spread of feed gas, such that the process space may be reduced. One of skill in the art would recognize that a smaller process space would result in less feed gas required and/or more efficient purging. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize oblong feed pipes in the process Kitahara. By doing so, the volume of the process chamber may be reduced, resulting in less feed gas required and more efficient purging (i.e. more require space volumes of purge gas being flowed through the reactor).

### ***Conclusion***



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Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Turocy whose telephone number is (571) 272-2940. The examiner can normally be reached on Monday-Friday 8:30-6:00, No 2nd Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

David Turocy  
AU 1762

A handwritten signature in black ink, appearing to read 'T. Meeks', with a large, stylized 'P' or 'T' as a first letter and a small 'i' below it.

**TIMOTHY MEEKS  
SUPERVISORY PATENT EXAMINER**